Excerpts from AMSAA's M109A6 Paladin Starter Motor Corrosion Analysis

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For the 2010
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Agenda

- What's a M109A6 Paladin?
- What's a Starter?
- Background
- Failed M109A6 Starter
- Analysis
- Analysis Results
- Recommendations
- Alternate Test Procedure
- Questions

"It is a capital mistake to theorize before you have all the evidence. It biases the judgment."

Sir Arthur Conan Doyle 1859 - 1930

What's a M109A6 Paladin?

What's a Starter?

Background

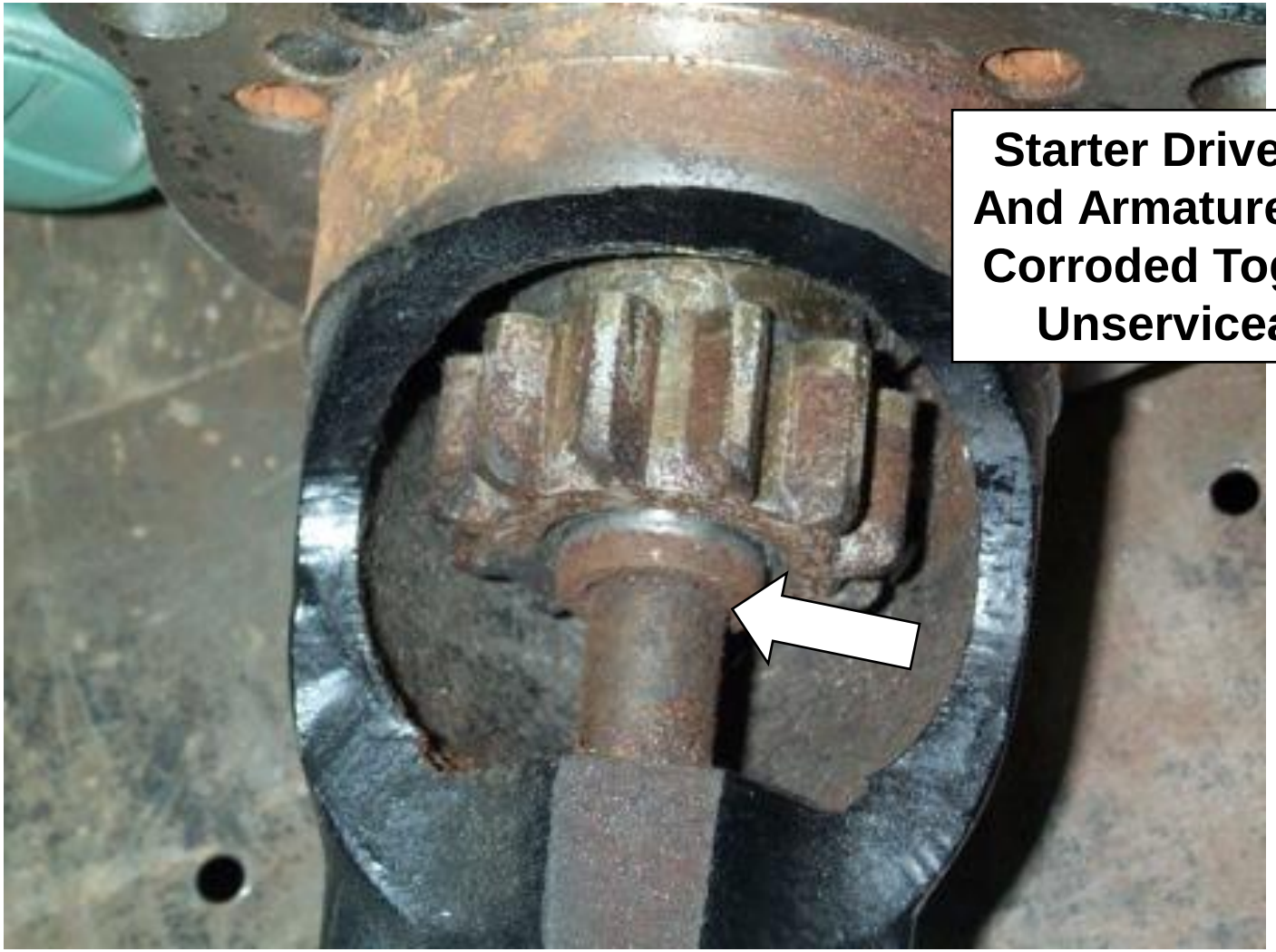
An Unusually High Rate of M109A6 Paladin Starter Motors were Failing

The Failure Mode was Excessive Corrosion

The Corrosion Rendered the Starters Inoperative

Problem Started after a Switch from the Original Manufacturer to a New Manufacturer

Failed M109A6 Starter



Starter Drive Gear And Armature Shaft Corroded Together Unserviceable

Analysis

Two Starter Motors (One from Each Manufacturer) were Analyzed.

A **Thorough** Material Analysis was Conducted on the Starters

Analysis Results

Despite the New Manufacturer stating that their Starter Motor Shaft's Utilized a Protective Zinc Plating, **NO** Zinc was Found on the Armature Shaft Analyzed.

Lack of a Protective Coating Undoubtedly Led to the High Rate of Starter Motor Failures

The Corrosion Problem **WAS NOT** Revealed Under the Required 96 Hour Salt Spray Test

Corrosion was Starting on the Original Starter, Where the Starter Drive Gear Slides on the Armature Shaft – Wearing the Protective Zinc Coating Off

Recommendations

Three areas of recommendations were made:

Recommendations for the Current Starter

Recommendations for Future Starter

Recommendations Regarding Future Salt Water Spray Testing.

“In any situation,

The best thing you can do is the right thing.
The next best thing you can do is the wrong thing.
The worst thing you can do is nothing.”

Theodore (Teddy) Roosevelt
26 th President of the United States

Recommendations (Cont)

It was Recommended that any New Existing Starter Motors not be Utilized, and Starters Already Utilized be Recalled and Destroyed

That for Future Starters, the Starter Armatures Material be Changed to Stainless Steel (Commercial Practice)

It was Recommended that all Starter Motors be Exercised During Salt Water Spray Corrosion Testing, and the Test Procedure be Changed so that any Similar Items be Exercised During Salt Water Spray Corrosion Testing

Failed M109A6 Starter

Starter Drive Gear Slides on Armature Shaft Wearing Zinc Coating Off

Proposed Alternate Test Procedure

- Conduct 24 Hours of Salt Spray Testing

- Utilize Test Item for 40 % of its Life Cycle

- Conduct an Additional 24 Hours of Salt Spray Testing

- Utilize Test Item for an Additional 40 % of its Life Cycle

- Conduct an Additional 48 Hours of Salt Spray Testing

Above Test Procedure Should Reveal Corrosion on Parts That Wear

Other Procedures May be More Viable, or Cost Effective

Questions????

And Hopefully Some Good Answers !